ENERGY RETROFIT

19th Century Multi-Unit

BASIC DESIGN LTD.

SUSSEX, N.B.

February, 1985

CREDA Project #2059

Prepared by:

Basic Design Ltd.

Canada/New Brunswick Conservation and Renewable Energy Demonstration Program

The Conservation and Renewable Energy Demonstration Program Program is administered in New Brunswick by the Energy Secretariat and managed jointly with Energy, Mines and Resources Canada. The Program is designed to help demonstrate promising conservation and renewable energy technologies, to develop public awareness and understanding of these technologies, and to create employment in new or existing industries.

Through over 100 demonstration projects in New Brunswick, a wide variety of conservation and renewable energy technologies have proven to be technically sound and economically attractive. These demonstration projects should now provide a catalyst for commercialization and lead to widespread adoption of many of these proven technologies.

This final report is based on a project which was financially supported by the Energy Demonstration Program. For further information on other demonstration projects funded in New Brunswick under this program, contact:

Conservation & Renewable
Energy Division
Energy Secretariat
P.O. Box 6000
Fredericton, N.B.
E3B 5H1
(506) 453-3897

Programme Canada/Nouveau-Brunswick de démonstration des économies d'énergie et des énergies renouvelables

Le Programme de démonstration des économies d'énergie et des énergies renouvelables est administré au Nouveau-Brunswick par le Secrétariat à l'énergie, en collaboration avec Energie, Mines et Ressources Canada. Ce programme tente d'abord de vérifier la fiabilité des techniques de conservation d'énergie, d'accroître la sensibilité du public envers ces techniques et, enfin, de favoriser la création d'emplois au sein des industries nouvelles ou déjà existantes.

Un grand nombre de projets de démonstration se sont avérés à la fois techniquement réalisables et économiquement attrayants.

Le succès ainsi rencontré encourage la commercialisation des procédés les plus accessibles. Cela entraînerait certes l'adoption d'un grand nombre de ces techniques par les propriétaires de domiciles et par l'industrie privée.

Ce rapport final est basé sur un projet qui a reçu une aide financière du Programme de démonstration. Pour de plus amples renseignements, communiquez avec la:

Division des économies d'énergie
et des énergies renouvelables
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D I S C L A I M E R

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D E N I D E R E S P O N S A B I L I T E

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1.0 EXECUTIVE SUMMARY

The primary objective of the project was to comprehensively retrofit a large three storey 19th Century frame structure in Sussex, New Brunswick. The proposed energy retrofit was to confront the fact of high energy cost (1981-82 oil cost $4,500) in two ways: reduce heat loss, and generate heat more efficiently and cheaply.

The benefits of this project would be reduction of heat loss by air-tightening and insulation, and more flexible and efficient heat generation, utilizing a wood chip burning "Kerr 'Titan'" solid fuel boiler with the existing oil furnace as back up and separate leased hot water heaters for each apartment in the building.

The system has been a success in that oil costs have been reduced considerably in comparison with previous years. Lack of availability of chip fuel in the Sussex area has forced the use of 2' by 4' logs as the main heat source. The complexity of installation of the wood boiler and its intergration with the existing oil furnace has caused an increase in labour and costs not initially anticipated.

SOMMAIRE RECOMMANDATION

Le but principal de ce projet était de démontrer d'importants travaux de rattrapage énergétique. Le projet consistait à rénover un immeuble de trois étages construit au 19^{c} siècle à Sussex (N.-B.) en vue de réduire des coûts énergétiques élevés (4500 $ pour le mazout en 1981 - 1982) de deux façons: réduction des pertes de chaleur et production de chaleur plus efficacement et à moindre coût.

Le projet devait avoir pour avantages: de réduire les pertes de chaleur par l'amélioration de l'isolation et de l'étanchéité, et l'installation d'un système de chauffage plus souple et plus efficace (une chaudière aux copeaux de bois "Kerr Titian" avec la chaudière au mazout existante comme système d'appoint et des chauffe-eau individuels loués pour chacun des appartements de l'immeuble).

Le système a été un succès puisque les coûts du mazout ont été réduits considérablement par rapport aux années précédentes. La difficulté d'approvisionnement en copeaux de bois dans la région de Sussex a rendu nécessaire l'utilisation de billes de 2 à 4 pieds comme source principale de combustible. La complexité de l'installation de la chaudière au bois et de son intégration à la chaudière au mazout existante a augmenté le coût des travaux et de la main-d'oeuvre de façon imprévue.

2.0 INTRODUCTION AND BACKGROUND

New Brunswick builds proportionately fewer new homes each year. In this period of recession there are even fewer house starts in the Province. This means that most people live in and buy older homes. A significant proportion of these homes are becoming more and more expensive to heat, built as they were with little or no insulation, non-solar siting, numerous single-glazed windows, etc.

Coupled with the stock of existing residential buildings becoming uneconomical is a frustrated segment of the population who either rent because they can't afford to buy housing (interest rates, uncertain economics) or rent because what is available to buy is either uneconomical or undesirable. Both groups are aware of escalating energy costs and the need for energy conservation, but by their tenant status can effect little change in their own use patterns.

This project is particularly interesting in that it demonstrates a co-operative strategy for both residential ownership and for energy-use. This strategy also suggests alternatives to the housing market today, and might encourage a more creative approach to home buying for those frustrated by the high-priced options, and a more creative approach to home heating for those willing and able to take more responsibility for their energy use.

A demonstration project like the one described here provides a strategy whereby inhabitants are encouraged to preserve large heritage buildings by making them competitive in today's market of spiralling energy costs.

This program will significantly reduce the cost of heating for each family. It will, as well, allow the tenants or owners to participate directly in reducing their energy costs. By a co-operative effort to supply and stack wood, and to stoking the boiler, the users can increase their energy savings and reduce the payback period. This element of tenant participation and the resultant saving should be considered as an important factor in a situation that traditionally has removed tenants from energy use responsibility. As well, a dual fuel system provides the flexibility and opportunity to "shop around" and take advantage of savings in price and supply of both oil and wood.

Initially a wood fired "Jetstream" furnace was considered as the heat source for this project. Upon evaluation it was found that the payback on the Jetstream system was too long to be attractive as a demonstration and there would be considerable inconvenience in fueling the furnace with cordwood.

The potential of a wood chip combustion unit was investigated as an alternative and was found to offer both convenience and positive payback.

The final installation utilized a Woodcan Stoker and a Kerr "Titan" Wood Fired Boiler.

3.0 DESCRIPTION OF DEMONSTRATION

A. Comprehensive Energy Audit

B. Air Tightening

1. Operable openings - 23 windows
   - 8 doors

2. Caulking and sealing of breaks in building shell, including sills, electrical boxes on interior wall, special openings, flu, dryers, vents, etc.

C. Thermal Insulation

1. Cellulose insulation blown into exterior wall cavities.

2. Insulate basement walls; 2 x 4 stud, 10.2cm. (4") batt, vapour barrier, drywall. (See detail.)

3. Third floor knee walls and inclined ceilings.

D. Mechanical and Miscellaneous

1. Comprehensive furnace servicing.

2. Installation of WoodCan Stoker, in Kerr "Titan" wood-fired boiler (see Appendix III).

3. Construction of Chip Storage Room.

4. Installation of separate 151 L, (40 gallon) electric water heaters for each floor and common laundry room.

4.0 OBSERVATIONS DURING INSTALLATION AND MONITORING

The three main areas that were dealt with during the retrofit were air tightening, insulation of the house walls and insulation of the basement.

The air tightening consisted of weatherstripping all operating windows and doors. For this we used both "Tago" and "3M" brands of vinyl V-strip weatherstripping. Non-operating windows or non operating sections of windows were caulked. Butyl-based indoor caulking was used to seal the windows as well as to seal gaps along wood trim, casing baseboards and other mouldings. as you can imagine in a house this size there are hundreds of feet of cracks, some very difficult to reach. The air test showed areas that we had missed. We were not able to seal the space between the floor joists but relied on the blown-in insulation to reduce infiltration in this area.

Blown-in cellulose insulation was used to insulate the house walls. The house is framed with a full four inch studding so that we were able to add about RSI 2.8 (R-16) with the cellulose. Infrared scanning showed the job was quite thorough, probably exceeding the guarantee of 95% coverage.

The insulating and air tightening of the basement was the most complicated and dirty part of the work. Irregular walls, various pipes and beams as well as electrical entrances provided many problem areas.

Interior faces of outside walls were studded up with a 2 x 6 material and insulated to RSI 3.5 (R-20). This frame was then covered with a 6 mil. polyethylene vapour barrier. All seams were caulked and the vapour barrier was sealed around windows and other penetrations. Between the floor joists pieces of 3.8 cm. (1½") extruded ploystyrene were used as a vapour barrier. This was caulked to the wall vapour barrier and to the joists and floor boards to complete the seal.

5.0 COST/BENEFIT ANALYSIS

Contributions:

Energy Secretariat/ Energy, Mines and Resources:	$17,800.00
Project Proponent:	8,176.84
	$25,976.84

Breakdown:

Capital Cost:	
a) Comprehensive Energy Audit	$ 633.65
b) Windows	880.00
c) Caulking and Sealing	1,148.39
d) Thermal Insulation	4,835.00
e) Insulation in Basement Walls	3,493.43
f) Knee Walls and Ceiling	1,105.40
g) Stoker Installation and Storage Room	9,900.65
Engineering and Management:	900.32
Energy Systems Performance Monitoring:	2,580.00
Final Report	500.00
	$25,976.84

As of this date the system has not been operable for a full heating season, however, a comparison oil usage for the October to February period for 1983/84 and 1984/85 as as follows:

October, 1983 - February, 1984:	$ 1,957.26*
October, 1984 - February, 1985 (after insulation)	1,168.44
Difference	$ 788.82

* Normalized to reflect Oct./84 to Feb./85 Degree Days

Payback Period:

Based only on the savings resulting from the insulation a payback period for the retrofit can be calculated:

Cost of retrofit only:	$12,996.19
Savings (Extrapolated using Normal Degree Days)	$ 1,526.00

$$\text{Payback} = \frac{\$12,996.19}{\$\ 1,526.00} = 8.5 \text{ years}$$

6.0 CONCLUSION

A project of this type could not be carried out by an average construction company with no special training in retrofit. The problems are too diverse and the decision-making process too complicated to be resolved without some technical resource. Likewise the consumer or home owner is likely to be confused and intimidated by the range of options and the vagueness of the potential benefits of this work. Especially in very large buildings like this one, the pay-back calculations are really guesswork. This is fine if all parties enter the project with open eyes, but in a more normal contractor-homeowner situation there is bound to be mistrust.

To date, due to a very short period of operation and fine tuning of the system, it is difficult to address the degree of success of the project.

In general, the system has been both complicated to install and to operate.

Also the absence of a local supply of chips has forced the use of cordwood as a heat source. In the final analysis, the energy used, in a building with many tenants and one furnace, is dependent on the convenience of each individual.

This system could, in the long run, prove to be a success if the difficulties in supply of fuel and operation are solved.

7.0 RECOMMENDATIONS

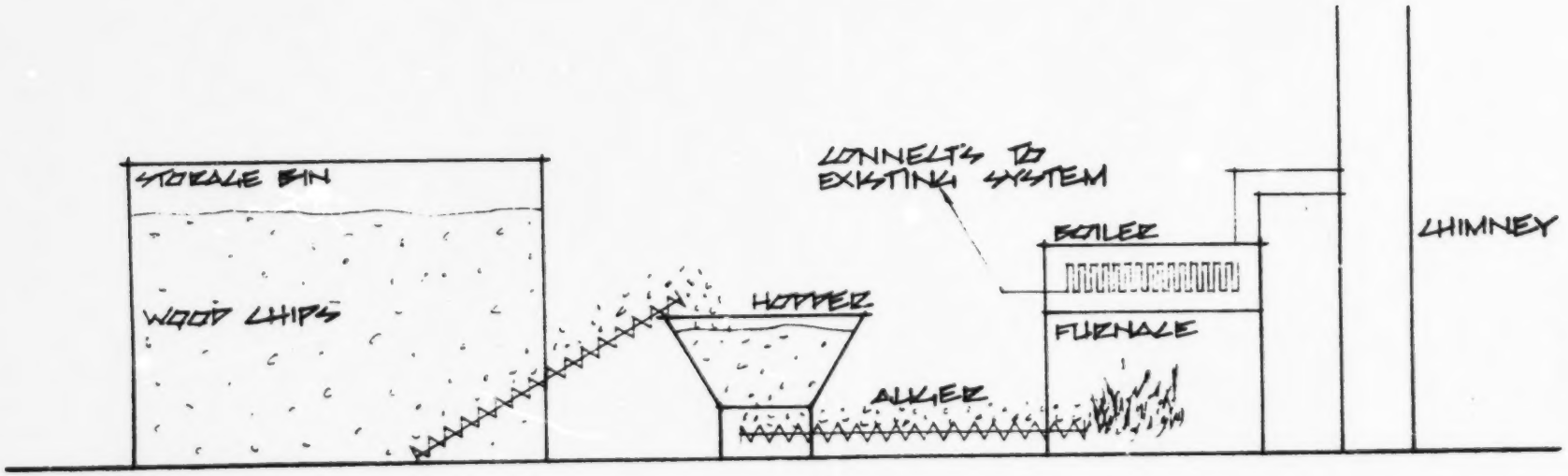
After having been involved with the R-2000 Super Energy Efficient Home Program of Energy, Mines and Resources, it is easy to see the gap that exists in resources and support in the area of home retrofitting. Retrofitting is a low priority area in spite of the fact that existing houses comprise, and will continue to comprise, the bulk of the housing stock until the turn of the century and beyond. By some calculations many homes undergo extensive renovation every 20-30 years. At this point in time these renovations are often being carried out in ignorance of energy saving measures that could and should be included in the work. Once these major renovations are finished it becomes relatively more expensive to retrofit if it means undoing any of the new work.

Probably nothing short of a co-ordinated program including design assistance, demonstration homes and monitoring can tune up the planning tools that are available and remove much of the uncertainty that now exists.

The supply and delivery of wood chips will have to be assessed to make this system convenient and affordable. Also, some research and design is needed for chip storage in a residential building. Problems of drying the chips and fire prevention should be addressed. Research and design is needed for an efficient, convenient method of transporting the chips from the storage room to the hopper.

In our opinion, the complexity and inconvenience of this system make it of questionable value for this application.

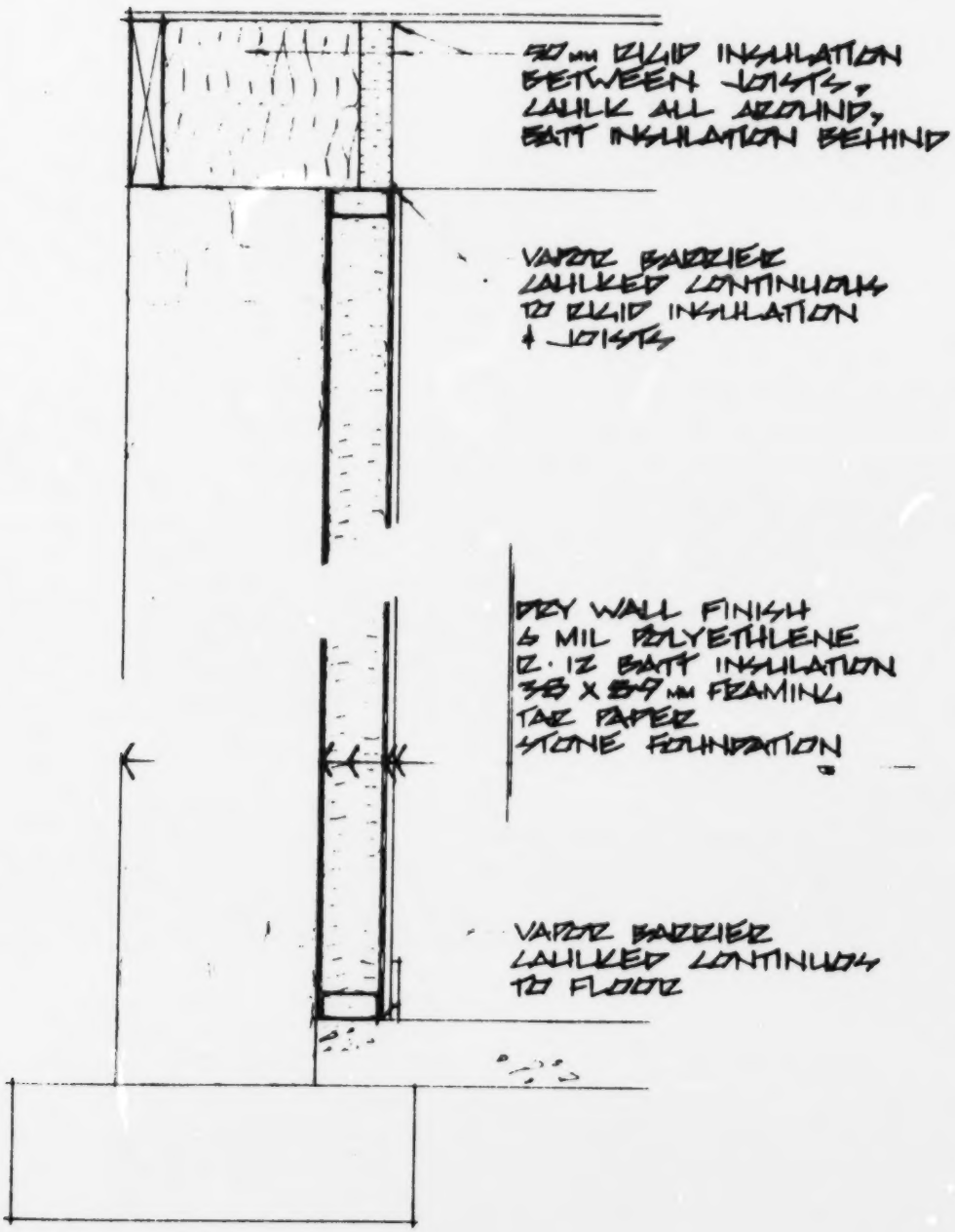
APPENDICES



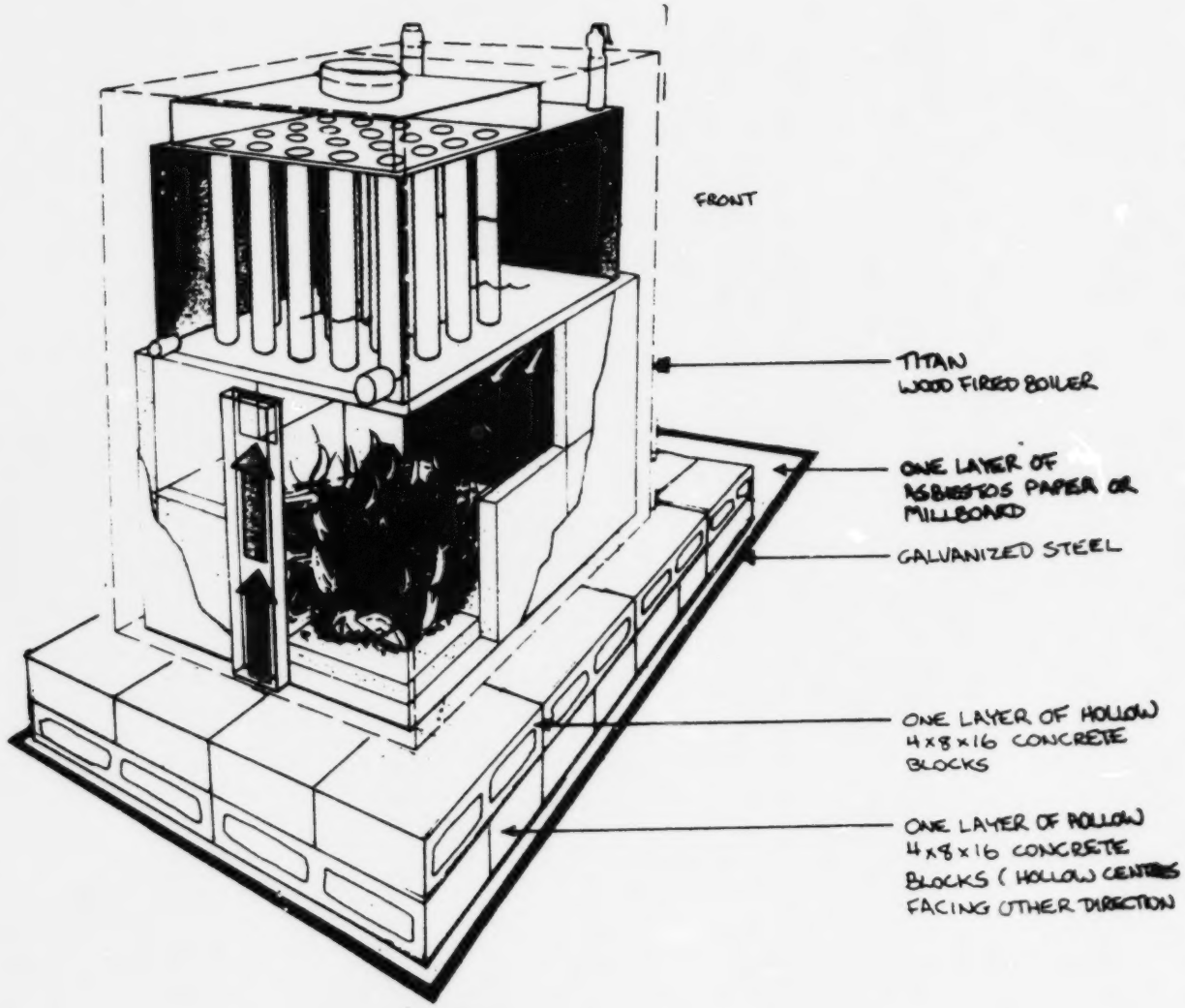
SCHEMATIC

APPENDIX I

APPENDIX II


50 mm RIGID INSULATION BETWEEN JOISTS, CAULK ALL AROUND, BATT INSULATION BEHIND
VAPOUR BARRIER CAULKED CONTINUOUS TO RIGID INSULATION & JOISTS
DRY WALL FINISH
6 MIL POLYETHILENE
R-12 BATT INSULATION
38 X 89 mm FRAMING
TAR PAPER
STONE FOUNDATION
VAPOUR BARRIER CAULKED CONTINUOUS TO FLOOR

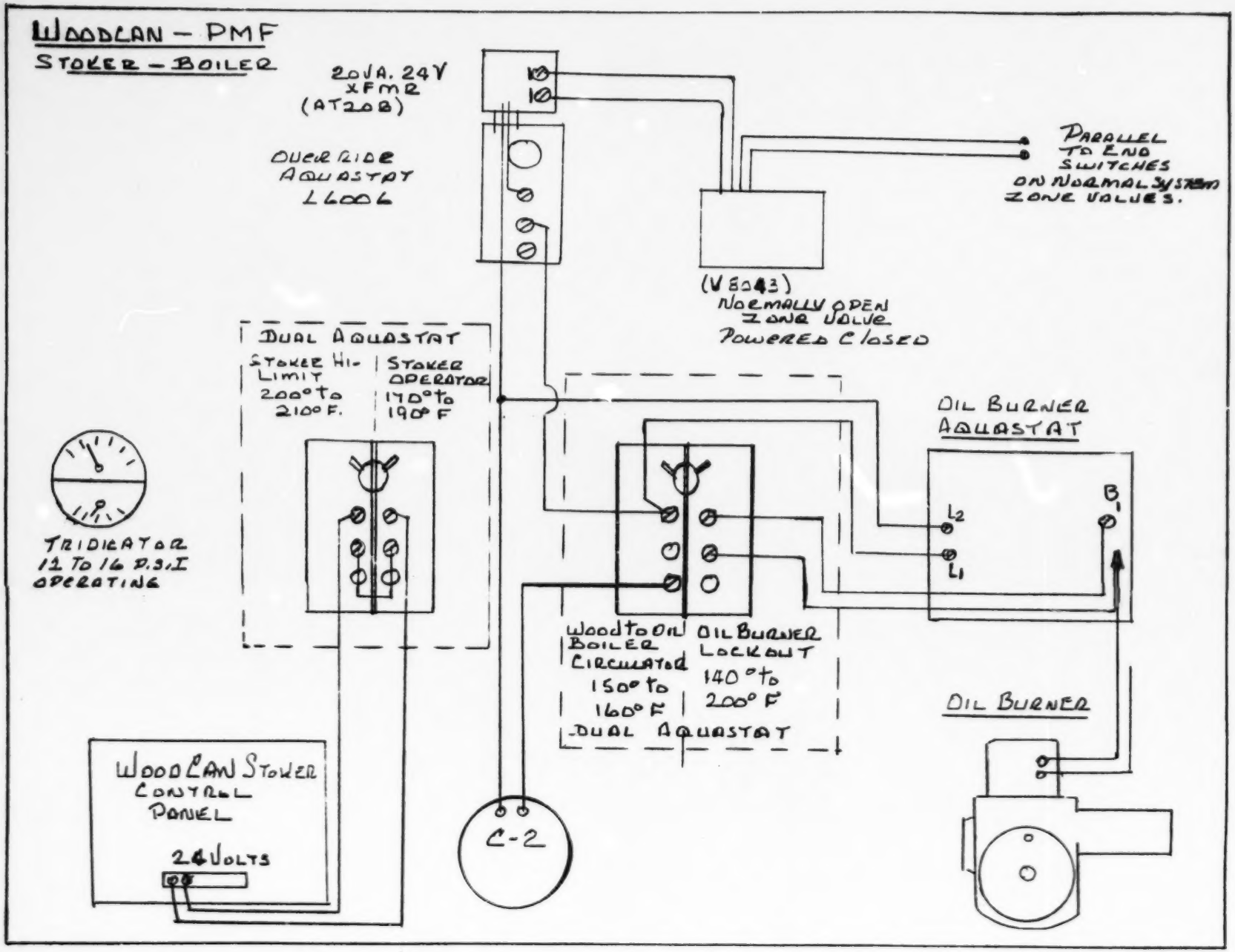
DETAIL: BASEMENT INSULATION



BACK VIEW

KERR

NON-COMBUSTIBLE BASE.


WOODLAN – PMF
STOKER – BOILER
20VA. 24V XFMR (AT20B)
OVER RIDE AQUASTAT L6006
PARALLEL TO END SWITCHES ON NORMALLY OPEN ZONE VALVES.
(V8043) NORMALLY OPEN ZONE VALVE POWERED CLOSED
DUAL AQUASTAT
STOKER HI-LIMIT 200° to 210° F.
STOKER OPERATOR 170° to 190° F
TRIDICATOR 12 TO 16 P.S.I OPERATING
OIL BURNER AQUASTAT
L2
L1
B1
WOODTOOIL BOILER CIRCULATOR 150° to 160° F
OIL BURNER LOCKOUT 140° to 200° F
DUAL AQUASTAT
OIL BURNER
WOODLAN STOKER CONTROL PANEL
24 VOLTS
C-2

APPENDIX IV

APPENDIX V

THERMOGRAPHIC SURVEY REPORT

Occupant Larry Stewart *Report Ordered By* Horizon Holdings

Address 864 Main Street
Sussex, NB

Survey Prepared by (Company Name and Address)

Enertek Limited
P. O. Box 1, Fredericton, NB, E3B 4Y2
(506)-455-0543

Technician *Dale O'Brien* *Equipment Used* *AGA 750*

Serial No. *5017*

INTRODUCTION:

This is a report of an infrared thermographic building survey from the interior of a stud frame building for the sole purpose of determining whether or not there are deficiencies with the above-grade installation of thermal insulation. The basic approach is to use an infrared imaging system to quickly and remotely measure temperature variations on the surface of exterior walls and ceilings. The various shades of blue represented in the thermograms represent apparent temperature levels through the chosen temperature range. Black corresponds to a colder temperature and white indicates a warmer temperature.

SUMMARY OF FINDINGS

A number of significant thermal anomalies were identified during the survey. Thermograms (infrared photographs) and actual photographs of these anomalies are included in this report. The location of the anomalies were also marked by masking tape during the survey. The majority of the problems identified were caused by air leakage, however, a few areas were also noted where missing or misplaced insulation is suspected.

CONCLUSIONS

A long payback period will occur if remedial measures are undertaken on the areas where missing wall insulation is suspected.

It is recommended that all anomalies identified as air leakage problems be remedied. A more attractive payback will be realized in carrying out these modifications.

DATE April 4, 1984 AUTHORIZED SIGNATURE Dale O'Brien

INFILTRATION AND THERMOGRAPHIC TESTING - 864 MAIN ST., SUSSEX, N.B.

The tests were conducted concurrently on Friday, March 16. The day was exceptionally warm (9°C) leaving us with barely the 10° temperature difference between inside and outside necessary for good thermography. The infiltration testing was conducted by Brian McNeish of Fundy Insulators, Sackville, N.B., using a door fan and computer analysis purchased from Retrospectors, Ottawa, Ont. Thermographic devices were provided by Dale O'Brien of Enertec, Fredericton, N.B.

Because of divisions in the large, four apartment building, it was impossible to depressurize the entire house. We had to treat it as two separate sections. Air leakage between the two sections made any quantitative analysis of air change or equivalent leakage area impossible. In spite of this limitation we were able to inspect the quality of the air sealing that had been done and note problem areas for later correction.

Each section was depressurized to 50 pascals, then two teams, one with smoke pencils and the other with the thermographic scanner, made a detailed study of interior and exterior surfaces. In some cases both groups had to work together to locate the source of infiltration. At the same time the exterior walls were inspected to discover any areas missed during the earlier blown-in insulation of these areas. Notes and photographs recorded the findings and in the case of the photographs, were also taken to show typical problem areas.

Despite the large volume of both sections of the building, depressurization took only a few seconds. On the whole, leakage was found in places that were missed during the initial sealing, or, in two cases, around areas where work was not yet completed.

THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 1

ENERTEK LIMITED

JOB/PROJECT

BUILDING/COMPLEXE
864 Main Street, Sussex, NB

1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	10:20			20°

WING / BÂTIMENT	WALL / FAÇADE
First Floor	East
SECTOR / SECTION	DETAILS / ÉLÉMENT
Bedroom/Livingroom	Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	7°C		

NOTES

Black (cold) areas on the wall indicate missing or misplaced insulation.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES

Actual photograph of thermogram 1-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	10:25			20°

WING / BÂTIMENT	WALL / FAÇADE
First Floor	East
SECTOR / SECTION	DETAILS / ÉLÉMENT
Bedroom/Livingroom	Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	7°C		

NOTES

White (warm) vertical studs revealed in this thermogram indicates that the stud cavities are uninsulated.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES

Actual photograph of thermogram 1-3.

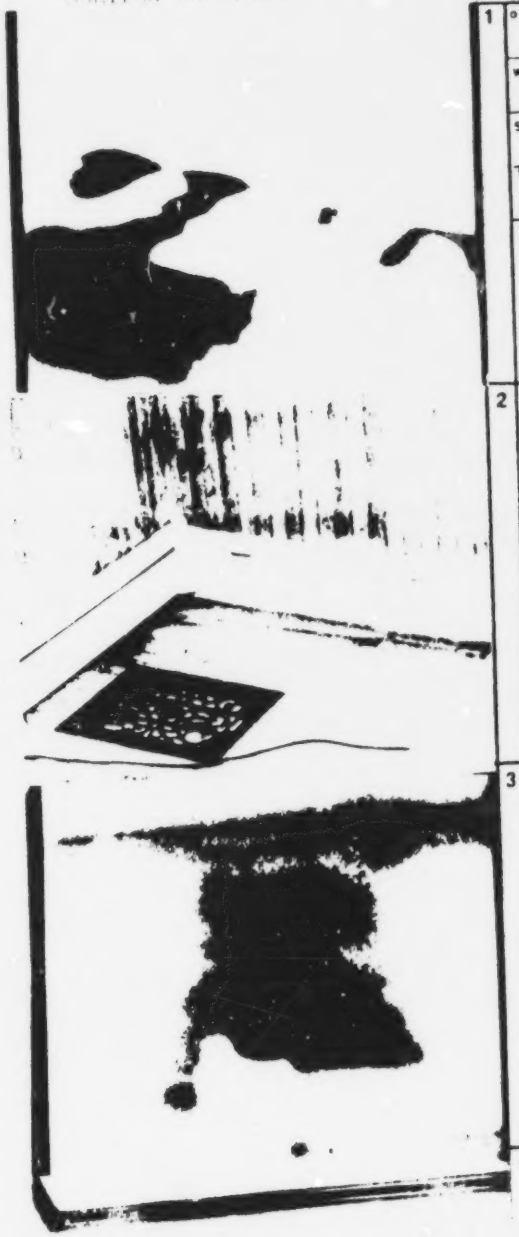
THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 2

ENERTEX LIMITED

JOB/PROJET

BUILDING/COMPLEXE
864 Main Street, Sussex, NB



1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	10:30			20°

WING / BÂTIMENT	WALL / FAÇADE
First Floor	South
SECTOR / SECTION	DETAILS / ÉLÉMENT
Livingroom	Floor

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	7°C		

NOTES
Dark (cold) well defined area is air leaking into the room from the basement through the floor vent. The dark flared areas along the floor indicate air leakage through the sill plate.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES
Actual photograph of thermogram 2-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	10:40			20°

WING / BÂTIMENT	WALL / FAÇADE
First Floor	West
SECTOR / SECTION	DETAILS / ÉLÉMENT
Dining Room	Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	7°C		

NOTES
Black (cold) area above the window indicates uninsulated wall section. This area is typical of all above window areas on the first floor.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES
Actual photograph of thermogram 2-3.

THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 3

ENERTEK LIMITED

JOB/PROJET
[illegible] BUILDING

BUILDING/COMPLEXE
864 Main Street, Sussex, NB

1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:00			20°

WING / BÂTIMENT	WALL / FAÇADE
Second Floor	East
SECTOR / SECTION	DETAILS / ÉLÉMENT
Bedroom	Wall

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e
20°C	8°C		

NOTES
Well defined black (cold) area indicates missing insulation.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e

NOTES
Actual photograph of thermogram 3-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:05			20°

WING / BÂTIMENT	WALL / FAÇADE
Second Floor	South
SECTOR / SECTION	DETAILS / ÉLÉMENT
Bedroom	Wall

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e
20°C	8°C		

NOTES
Black (cold) area on the wall indicates air leakage through the electrical outlet.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e

NOTES
Actual photograph of thermogram 3-3.

THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 4

ENERCHEK LIMITED

JOB/PROJET
HORIZON HOLDINGS

BUILDING/COMPLEXE
864 Main Street, Sussex, NB

1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:10			20°

WING / BÂTIMENT	WALL / FAÇADE
Second Floor	
SECTOR / SECTION	DETAILS / ÉLÉMENT
Livingroom/Kitchen	Wall/Ceiling

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES
Black (cold) flared areas indicate air leakage (infiltration) along the wall/ceiling junction.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES
Actual photograph of thermogram 4-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:15			20°

WING / BÂTIMENT	WALL / FAÇADE
Second Floor	
SECTOR / SECTION	DETAILS / ÉLÉMENT
Washroom	Ceiling

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES
Black (cold) flared areas along the ceiling indicate air infiltration.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES
Actual photograph of thermogram 4-3.

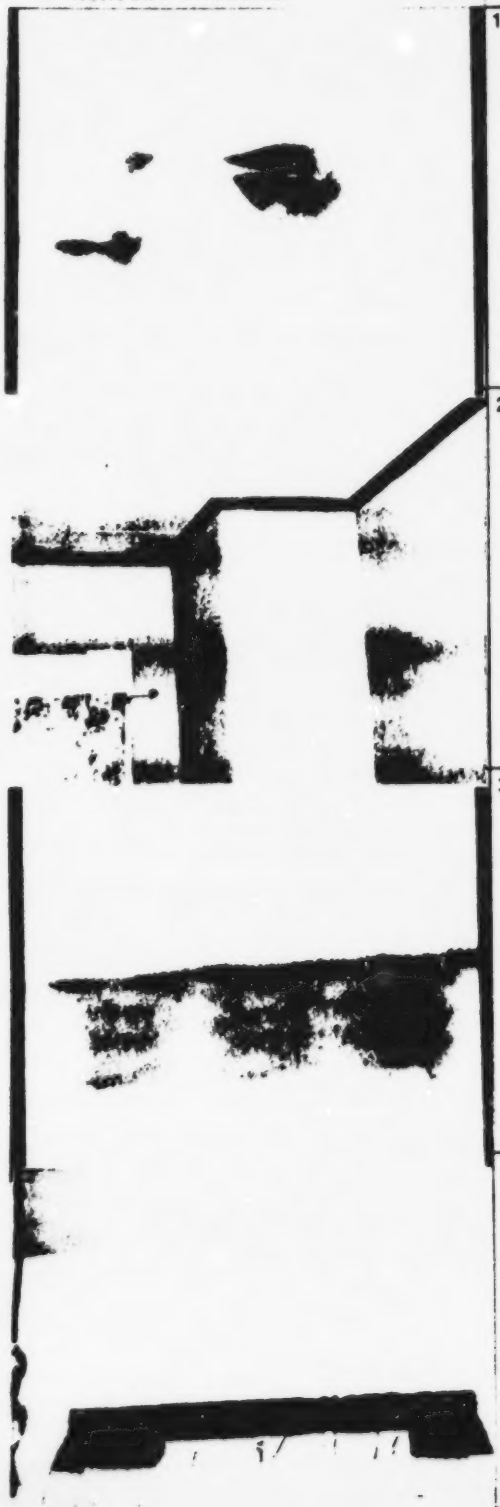
THERMOGRAPHIC INVESTIGATION
DATA SHEET

PAGE 5

ENERTEK LIMITED

JOB/PROJET: HORIZON HOLDINGS

BUILDING/COMPLEXE: 864 Main Street, Sussex, NB



1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:20			20°

WING / BÂTIMENT	WALL / FAÇADE
Second Floor	East
SECTOR / SECTION	DETAILS / ÉLÉMENT
Girl's Bedroom	Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES

Air leakage (infiltration) is identified in this thermogram along wall/ceiling junction.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES

Actual photograph of thermogram 5-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:25			20°

WING / BÂTIMENT	WALL / FAÇADE
Second Floor	North
SECTOR / SECTION	DETAILS / ÉLÉMENT
Girl's Kitchen	Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES

White (warm) vertical lines reveal the wall studding which indicates an uninsulated wall cavity.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES

Actual photograph of thermogram 5-3.

THERMOGRAPHIC INVESTIGATION
DATA SHEET

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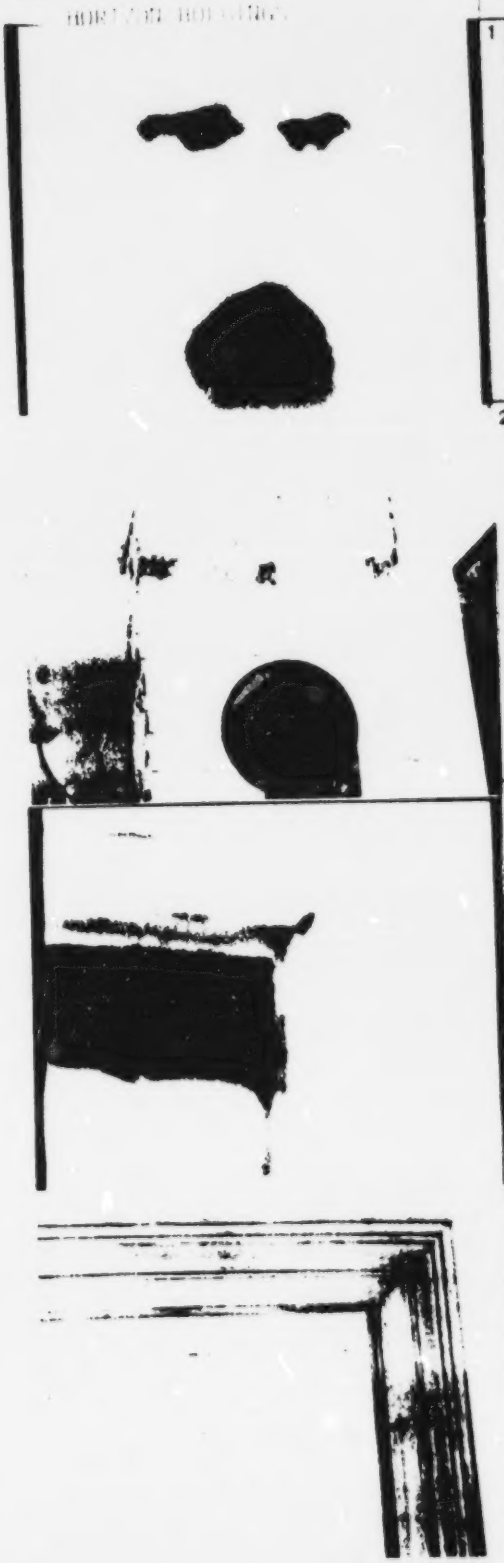
[redacted] LIMITED

JOB/PROJECT
[redacted]

BUILDING/COMPLEXE
864 Main Street, Sussex, NB



1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:30			20°

WING / BÂTIMENT	WALL / FAÇADE
Third Floor	
SECTOR / SECTION	DETAILS / ÉLÉMENT
Dining Room	Chimney

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e
20°C	8°C		

NOTES
Black (cold) flared area along the top of the chimney indicates air infiltration. The larger cold area is the stove pipe.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e

NOTES
Actual photograph of thermogram 6-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:35			20°

WING / BÂTIMENT	WALL / FAÇADE
Third Floor	
SECTOR / SECTION	DETAILS / ÉLÉMENT
Dining Room	Window

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e
20°C	8°C		

NOTES
Slight air leakage is identified at the top right corner of the window.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o/T_e	RH_i/HR_i	RH_o/HR_e

NOTES
Actual photograph of thermogram 6-3.

THERMOGRAPHIC INVESTIGATION
DATA SHEET

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ENERTUK LIMITED

JOB/PROJET: HORIZON HOLDINGS

BUILDING/COMPLEXE: 864 Main Street, Sussex, NB

1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:40			20°

WING / BÂTIMENT	WALL / FAÇADE
Third Floor	
SECTOR / SECTION	DETAILS / ÉLÉMENT
Central Bedroom	Ceiling

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES
Black (cold) areas on the ceiling indicate air leakage due to missing or misplaced insulation.

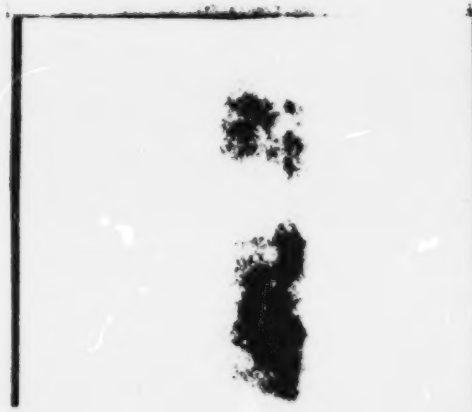
2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES
Actual photograph of thermogram 7-2.



3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:45			20°

WING / BÂTIMENT	WALL / FAÇADE
Third Floor	North
SECTOR / SECTION	DETAILS / ÉLÉMENT
N.E. Bedroom	Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES
Black (cold) wall area indicates an uninsulated stud cavity.

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT	WALL / FAÇADE
SECTOR / SECTION	DETAILS / ÉLÉMENT

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES
Actual photograph of thermogram 7-3.

THERMOGRAPHIC INVESTIGATION
DATA SHEET

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ENERTEK LIMITED

JOB/PROJET: HORIZON BUILDING

BUILDING/COMPLEXE: 864 Main Street , Sussex, NB

1

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF
84-03-16	11:50			20°

WING / BÂTIMENT: Third Floor
WALL / FAÇADE: North
SECTOR / SECTION: Kitchen
DETAILS / ÉLÉMENT: Wall

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e
20°C	8°C		

NOTES

Black (cold) wall area indicates missing insulation.

2

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT:
WALL / FAÇADE:
SECTOR / SECTION:
DETAILS / ÉLÉMENT:

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES

Actual photograph of thermogram 8-1.

3

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT:
WALL / FAÇADE:
SECTOR / SECTION:
DETAILS / ÉLÉMENT:

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES

4

DATE	HOUR/HEURE	ROLL/PELLICULE	FRAME/CLICHÉ	LENS/OBJECTIF

WING / BÂTIMENT:
WALL / FAÇADE:
SECTOR / SECTION:
DETAILS / ÉLÉMENT:

T_i	T_o / T_e	RH_i / HR_i	RH_o / HR_e

NOTES